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PRUNE RUST.

By NEWTON B. PIERCE.

[Plates XXXIV-XXXVII.]

The prune, in common with many other drupaceous fruits, frequently has its leaves much injured or may be even entirely defoliated by a species of rust. This parasite belongs to the genus *Puccinia*, and is known as *Puccinia pruni* Pers. To Californians the effect of this disease on the prune, plum, and the peach is a very serious matter. The Pacific coast is known as the home of these fruits, and any widespread and detructive disease which affects them all should be well understood by horticulturists.

DISTRIBUTION AND ACTION ON THE STOCKS.

Prune rust is widely known, having almost as extended a distribution as the prune itself. It is found in the United States from the Atlantic to the Pacific, and the various countries of Europe are also quite generally infected. In the Eastern States it is most injurious to the plum and peach. In Texas the peach suffers severely from it, and in some sections is completely defoliated. In California the rust has a wide distribution. In the southern part of the State the injury is most serious in the coast valleys, where both the prune and peach are not unfrequently entirely stripped of their leaves before the wood is matured. Much fruit is lost both by the direct and the indirect action of the parasite. When the tree is defoliated before the fruit is mature the latter shrinks and becomes worthless; but the greatest loss generally occurs from the nonproductiveness of trees left with their wood immature in the fall.

As yet only two forms of spores are known for this species of *Puccinia*, the uredo or summer spore, and the teleuto or winter spore. These spores are produced in varying proportions on different plants. On some hosts the uredospores greatly predominate over the teleutospores, while on other hosts the reverse is true. It appears probable that conditions of food, humidity, climate, and season all tend to vary these results. Both spore forms are produced on the under side of the leaves, and probably both may, under some conditions, serve as winter spores.

The rust is known to affect the prune, plum, peach, nectarine, apricot, cherry, and almond. In California the prune sustains much greater injuries from rust during some seasons than others, depending largely on the early or late development of the disease. In 1891, at Santa Ana, the rust developed early in some orchards, and much fruit was either lost or materially injured by the premature fall of the leaves. In 1892, in the same orchards, the disease developed later and with much less virulence. Where severe enough to defoliate the trees the defoliation did not occur until the fruit had been gathered and most of the wood was properly ripened. Both the general and special effects of the disease vary according to the situation of the orchard, the age and variety of stock, the soil, etc.

When it attacks the prune the parasite causes the upper surface of the leaf to turn a yellowish or reddish color in irregular blotches, of greater or less extent, according as the points of attack are separate or confluent. The spores make their appearance in brownish or blackish patches on the under surface of the leaf, the brown patches usually being made up of uredospores and the black of teleutospores. The uredospores often appear earlier in the season than the teleutospores, the latter being normally developed as winter spores. Both kinds of spores are of good size and well formed. When the rust is abundant the tissue of the lower portion of the leaf is destroyed in such a manner as to present continuous, brown, lifeless areas. With the Tragedy prune, grown on the place of Mr. D. Edson Smith, of Santa Ana, the tissue of the under surface of the leaves was entirely destroyed, and was covered by an almost continuous and very dense layer of spores.

The action of the rust on the plum is similar to its action on the prune. In Texas it is stated that wild plums are attacked. Both uredospores and teleutospores are found, the latter often predominating.

Peach trees are frequently badly affected by this rust, and the trees of an entire orchard are sometimes defoliated. On the upper surface of the leaves the infected parts become yellowish or reddish in irregular and somewhat angular blotches, and on their under surface in separate or confluent, yellowish or brown, somewhat circular spots. The spores are mostly uredospores, although the teleutospores are often found, at least in California.* The fungus lives over winter on the tender twigs of the peach, frequently almost killing the young nursery stock. For this reason it would be well to spray the trees during the dormant season as well as after the growth has begun. For this winter treatment the following mixture is recommended: 5 pounds of copper sulphate, 10 pounds of lime, and 45 gallons of water.

The extra amount of lime causes the fungicide to adhere better than the usual amount of 5 pounds in ordinary Bordeaux mixture. It is not positively known if the same holds good with the prune and plum, although it is probable. Where rust is very bad upon either of these fruits the winter treatment is recommended.

On the nectarine the rust produces both uredospores and teleutospores, but, as with the peach, the uredospores greatly predominate.

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*In the Annual Report of the Commissioner of Agriculture for 1887, pp. 353-354, it is said that no teleutospores are developed on the peach. Although less abundant than the uredo form, they have invariably been found on badly infected peach leaves in southern California, and these leaves have been obtained from widely separated points in Los Angeles and Orange Counties, as at Florence, Santa Ana, Arch Beach, etc. They were fully matured by the middle of October.

The teleutospores are sometimes found in a semi-rudimentary condition. The spots are found on both surfaces of the leaf. The effects on the nectarine are similar to those on the peach.

In southern California the apricot is not commonly affected by rust to as great an extent as are the prune and peach, although usually the disease may be seen in nearly all orchards in the coast region. Sometimes the margin of the leaf is most affected, but all portions may be diseased. As in the previously mentioned cases, the uredospores predominate. The teleutospores are less abundant than upon the peach. The two forms when present are large and well developed. The rust produces on the apricot small, irregular, reddish, scar-like spots, which show on both surfaces of the leaf. The under surface finally turns a yellowish color and becomes powdery with the abundant uredospores. When badly diseased, the whole leaf may turn yellow and fall prematurely. As yet, however, I have not seen this tree entirely defoliated by the disease.

In the East the cherry is more or less injured by the same parasite, and I have no doubt that this is also the case for portions of the Pacific coast. As the cherry is neither extensively nor successfully grown in the warmer valleys of southern California, we have not had sufficient material for a general study. Farther north, and in the more elevated regions of the southern portion, where this fruit thrives, the parasite may be looked for.

The almond is infected by the rust to a limited degree. Both teleutospores and uredospores have been found, although the former were rare in the material examined. The teleutospores were rather small. The uredospores varied greatly in size and form, and in thickness of their walls. Some were dark and nearly spherical, while others were normal in form and thickness. So far as seen, the almond is not defoliated in California by the parasite.

TREATMENT.

The prune rust fungus is a truly endophytic parasite, vegetating and obtaining its nourishment wholly within the tissues of its host, and only appearing at the surface of the leaf for spore formation. This makes it evident that the treatment for the disease should be preventive in its nature. The application of sprays or other treatment after the parasite is within the tissues of its host can not act remedially and can only serve to prevent further infection.

The serious action of this parasite during the summer of 1891, and the fact that its attacks were more general and severe than in 1889, seemed to indicate that the disease was increasing, and it was decided to undertake a series of preventive experiments. This was the more necessary because the climatic conditions are very different in the coast valleys of southern California from those of the portions of the Eastern States where most experimental work of this nature has been conducted. Methods applicable to the one region might be unsatisfactory in the other. It was desirable, also, that the work be done with the prune, which is not grown much in the East, and with which no experiments, as far as known, had been conducted. The line of treatment offering the greatest prospects of success was published by the writer early in the spring of 1892, so that those who desired might experiment in their own orchards.*

Portions of two prune orchards, in which the rust had developed to a marked extent in 1891 were selected for the experiment. The orchards were about 5 miles apart, one south of Santa Ana and the other east of Orange, Cal. The trees in one orchard were sprayed with modified eau céleste, while a portion of those in the other orchard were sprayed with modified eau céleste and a portion with ammoniacal copper carbonate. The number of treatments and time of application were varied with different lots of trees. Besides these, two other orchards in the vicinity of Santa Ana were sprayed by their owners, both gentlemen using the modified eau céleste according to the formula followed in our work. One of the orchards, belonging to Mr. Charles Leslie, is situated northwest of Santa Ana, on ground somewhat lower than that of any of the other orchards treated.

Fortunately for the growers, but unfortunately for our experiments, the rust did not develop as early, and was not as general nor as virulent in the season of 1892 as in 1891. The disease did develop, however, in the orchard of Mr. Leslie, though later than usual and with less virulence. Here a striking contrast was observed between the treated and untreated trees about the 1st of October, and we are now able to show the efficacy of the spray used and to give the details and necessary expense of application.

In relation to the application of sprays, it may be said that for young trees of small size and pruned low, the knapsack sprayer may sometimes be used to advantage. This is especially true of gardens and orchards of small extent. Treatment of small trees with a knapsack sprayer will require from one and one-half to three minutes per tree, according to size and state of development of the foilage. The tank of the sprayer holds about 4 gallons, and to avoid loss of time some convenient mode of refilling should be near at hand in the field. For trees 4 or 5 years old a cart sprayer holding one or two barrels of the spraying mixture is very convenient. Experiments were conducted with the "Little Giant" cart, holding slightly over a barrel. The tank is mounted on two large iron wheels, with a third and smaller wheel in front as a support. It is supplied with a good brass force pump capable of throwing two sprays. It may be drawn either by hand or by a horse directly attached, or it may be placed in a light one-horse wagon. The last arrangement raises the head of liquid, and enables the cart to be easily drawn in soft or plowed ground. A fair-sized orchard can be thus treated with little loss of time.

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* See notes on "Fungous diseases and their treatment."<Proc. and Trans. of the Pomological Soc. of Southern California, Redlands, May 27 and 28, 1892, pp. 24-29; also, Rural Californian, June, 1892, pp. 303-305, and extracts in numerous other journals. The present season's work has shown that the disease may be controlled with fewer sprayings and at less expense than were thought necessary at the time these recommendations were made.

If the trees to be sprayed are large (6 years old or older), and especially if the orchard be extensive, it is well to have a special tank. The horizontal wooden tank, resembling a cylinder, but narrowed toward one end, is now considered by many the best pattern made, although somewhat more expensive than the rectangular box tanks. It is, however, much less liable to leak, and is especially suited to keeping its contents well stirred.*

From the fact that the rust fruits mostly on the under surface of the leaves, as well as from a study of the habits of other fungi in this region,† it appears probable that infection of the host occurs in most instances from the germination of spores on the under side the leaf. For this reason it is essential that the under surface receive the most thorough treatment. In the experiments here described four nozzles were used, viz, the Climax, the San José, the Cyclone, and the Improved Vermorel, and their adaptation to the work noted. They are all good nozzles, but when used with eau céleste mixtures a serious defect is found in all of them. The corrosive action of this spray, whether the latter be formed according to the modified formula or not, destroys the brass netting of the Climax nozzle and the brass plate containing the slot of the San José. The action on the other nozzles is similar, but the brass being thicker the openings enlarge less rapidly. The manufacturers of the Climax nozzles state their intention to supply aluminium nets for them, which will probably withstand the spray. This is a more important matter than it at first appears, and is especially so to Californians. In California fewer applications of fungicides are required than in the East, because of the partial absence of summer rains along the southern Pacific coast, but these applications should be more thorough. To properly spray a tree with one or two applications the spray must be fine, uniform, and carefully applied. To form this spray the nozzles used must be in good condition, which is not true when the openings are enlarged; in this case the liquid falls on the foliage in coarse drops, which run together and dry. When large areas are thus wetted the fluid will often "creep" or "crawl" when drying, as paints do when water is accidentally mixed with the oil. In this way the copper salts are brought together and dried in a few large areas instead of being distributed over the leaf in small drops which dry where they fall. With enlarged openings in the nozzle much of the leaf is therefore left without the protection of the fungicide, while with the fine spray the numerous collections of dried copper are distributed by the humidity of the atmosphere or dews and fogs to all parts of the leaf surface. To those who have applied the resin washes to citrous trees it will be apparent that the mode of applying sprays for fungi is quite different from that followed for scale insects. For the latter an effort is often made to uniformly coat the branches and foliage with the mixture, as the nature of the spray used will allow of this even when the parts are completely wetted. With the copper washes, however, the parts should be finely sprayed and not overwetted if the attacks of fungi are to be prevented in the most satisfactory manner. Foliage thus overwetted by almost any of the copper sprays, and especially by eau céleste, is apt to be more or less burned. Prune trees have been entirely defoliated where the spray was too coarse.

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*For those who may desire to construct a tank of this description, measurements are given of the one owned and used by Mr. Leslie in his treated orchard. It is intended to rest on a platform placed upon the bolsters of a common lumber wagon, and supported and kept from rolling by transverse scantling made concave above. The length of the side of the tank is 9 feet 8 inches. Its diameter at the small head is 27 inches inside measure, and 31 inches outside measure. At the large end the inside diameter at the head is 31 inches, and the outside measure 35 inches. This diameter allows the tank to fit well between bolster stakes, which are 3 feet apart. The heads of the tank set back 3 inches from the ends of the staves. The staves are made of 2-inch dressed plank about 4½ inches wide at the broad end and narrowed toward the small end to about 4 inches, and are all beveled on the edge. Six bands of iron are used as hoops, which are $\frac{3}{16}$ by 2 inches. One is placed opposite each head and the other four at equal distances between them. This tank holds, approximately, 300 gallons, and by placing it so that its upper surface is level the tank may be completely filled; thus arranged, the last of the fluid it contains will flow to the large end, where all may be pumped out by the force pump situated there. The tank is filled through an opening 12 by 16 inches, supplied with cover and screen, located at the center of the tank. Near the bottom of the large head is a bung for cleaning out. The force pump is firmly fastened to the top and near the large end of the tank, and the suction pipe reaches nearly to the bottom. The pump should be strong, double-acting, furnished with large air chamber to insure an even flow, and is usually of the piston pattern. Brass fittings or a brass pump are preferable to those of iron. Arrangements should be made for dividing the discharge pipe by the attachment to its ends of separate lengths of hose. The hose should be of good quality and each piece should be about 25 feet long. Thus equipped, two trees may be sprayed on each side of the wagon before it is moved. The free end of each hose should be attached to a brass pipe 6 or 7 feet long, and carrying the nozzle at its extremity. Iron pipe corrodes too easily with the copper sulphate mixtures, and, being heavier, the work done with it is not apt to be as satisfactory.

†See observations on the habits of *Cercospora circumscissa* Sacc. in this Journal (vol. VII, No. 2, p. 69). This parasite is shown to affect almond branches to a much greater extent upon the lower than upon the upper surface. The more favorable conditions of humidity below the branch, there assigned as the partial cause, would apply equally well in the present case.

If the San José or Climax nozzle be used, the perforated plates and brass-wire screens should be replaced as soon as corroded. With the Cyclone nozzle no arrangement is found for a renewal of the corroded parts. Hence this nozzle, to be satisfactory, should be made of noncorrosive metal. It presents one very desirable feature, viz., the spray is thrown out laterally. Where the spray is thrown directly ahead from the workman, especially if small trees are being treated, or if there be a wind, much of the spray passes beyond the tree. Besides this, the under surface of the foliage is not so perfectly sprayed as it could be by the use of a nozzle throwing a lateral spray upward toward the under surface of the leaves, or downward upon their upper surface. The application is thus made directly to the leaf surface to be treated and little loss of material or time is sustained. With those having a large number of trees to spray, this saving is of prime importance. There should always be a swivel in the pipe to which the nozzle is attached. This allows the easy turning of the pipe while spraying the interior of the top of the tree, and the spray is sent in all directions without withdrawing the pipe. Where it is not absolutely necessary to use eau céleste, corrosion of the nozzles will be avoided by the use of ammoniacal copper carbonate. This spray, besides being nearly or quite as effective as the modified eau céleste and lacking the corrosive action on nozzles and other metallic fittings, has the advantage of not showing to an obvious extent upon the treated fruit. The eau céleste is often discernible upon the prunes at the time they are gathered.

The following are the formulæ for making ammoniacal copper carbonate and modified eau céleste:

Ammoniacal copper carbonate.—In a wooden pail place 5 ounces of copper carbonate, soften the carbonate to a paste by the addition of a little water, add 3 pints of strong ammonia (26°), and stir until the carbonate is dissolved. If it will not wholly dissolve add sufficient ammonia to accomplish that result. Pour into a barrel holding 45 or 50 gallons and fill the barrel with water.

Modified eau céleste.—Dissolve 4 pounds of copper sulphate in a wooden vessel containing 10 or 12 gallons of water, and afterwards stir in 5 pounds of sal soda. When the soda is dissolved pour in 3 pints of strong ammonia (26°) and dilute to 45 gallons with water.

As already indicated, the Leslie orchard, which was sprayed with modified eau céleste, presented the most evident beneficial results seen in any of the orchards treated. This, it is believed, was not due to any superiority of eau céleste over ammoniacal copper carbonate, but to the early and more marked development of the disease in that orchard than in the others. It has been shown during the past summer, in a carefully conducted series of experiments in combating the shot-hole fungus of the almond (*Cercospora circumscissa*), that modified eau céleste and ammoniacal copper carbonate possess almost exactly equivalent value as fungicides. This being true, there are several reasons why the amoniacal copper carbonate is to be preferred for this work: (1) It costs much less than the other spray; (2) it is less liable to injure the foliage, and does not seriously affect the nozzles and other metal appliances used in spraying; (3) spotting of the fruit and foliage is much less distinct than that caused by modified eau céleste; (4) it is easier to prepare.

The cost of the ammoniacal copper carbonate will vary in different portions of the country. The wholesale price of copper carbonate in the Eastern cities is about 40 cents per pound. To this about 3 cents should be added for freight to the Pacific coast, making the cost 43 cents per pound in California. Ammonia (26°) can be had at 8 cents per pound in the East, and should not exceed 10 cents per pound in California. At these prices the cost of the ammoniacal copper carbonate solution, made according to the above formula, would be $1 per 100 gallons. This cost may be reduced by making the copper carbonate at home from sulphate of copper and sal soda, as follows:

To make copper carbonate.—Dissolve in a large wooden tub 6 pounds of copper sulphate in hot water. In another wooden vessel dissolve 7 pounds of sal soda in hot water. When both solutions are cool pour the soda solution into the copper solution and fill the tub with water. Unite these mixtures slowly or they will overflow. Stir thoroughly after the water is added and allow the solution to stand twenty-four hours; then draw off all the clear liquid with a siphon. Fill the tub with water, stir, and again allow it to stand twenty-four hours and settle, and then draw off the liquid as before. Dry the substance remaining, which is mostly carbonate of copper. When dry it should be a light green powder. The sediment may be dried in an earthen jar kept in a kettle of boiling water or in the sun.

If the sulphate of copper and sal soda are of good quality, which may be told by the deep blue of the former and the transparency of the latter,* the quantity given in the above formula should make 2½ pounds of the carbonate.

The average wholesale price of copper sulphate in the East is 6 cents per pound and that of sal soda 1½ cents. The Santa Fe Railroad Company has quoted freight rates on these chemicals from Chicago to Santa Ana at 1½ cents. This makes the cost of copper sulphate on the Pacific coast 7½ cents and of sal soda 3 cents per pound. At these rates 6 pounds of copper sulphate and 7 pounds of sal soda would cost 66 cents; and as this quantity makes 2½ pounds of the carbonate, the cost per pound of this chemical, when made at home, is 26 cents. For 45 gallons of spray, according to the above formula, there would be used 5 ounces of carbonate, worth 8 cents, and 3 pints of ammonia, worth 30 cents, a cost of 80 cents for 100 gallons, or a saving of 20 cents per 100 gallons by the home manufacture of the carbonate. At the above prices for copper sulphate, sal soda, and ammonia, when used to make modified eau céleste, 45 gallons would cost 75 cents, or $1.66 per 100 gallons.

The amount saved by using the ammoniacal copper carbonate instead of the modified eau céleste is worth considering where a large orchard is to be sprayed. With the other advantages already enumerated, the former spray becomes much more desirable than the latter for most work.

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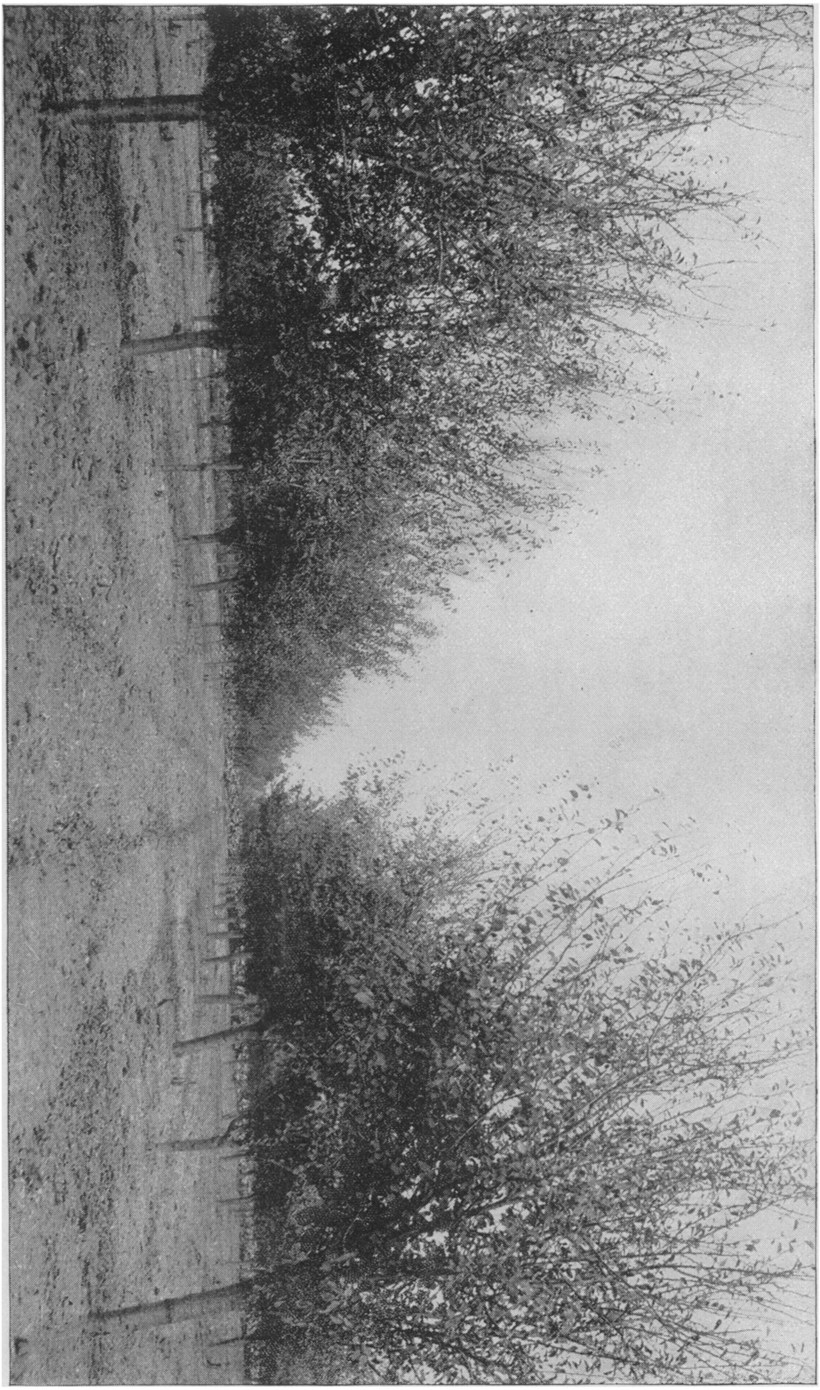
*Air-slaked sal soda or pale blue sulphate of copper should never be used in any spray work. If the former be used in making copper carbonate, a magma will be formed when the two mixtures are united, which will prevent the satisfactory completion of the process; and if it be used in making the modified eau céleste the acid of the spray will remain so strong as to burn the foliage.

The cost of spraying an orchard depends upon the size of the trees, the state of development of the foliage, the presence or absence of wind when the sprays are applied, the fineness of the spray used, the thoroughness of the work, and the cost of labor and material.

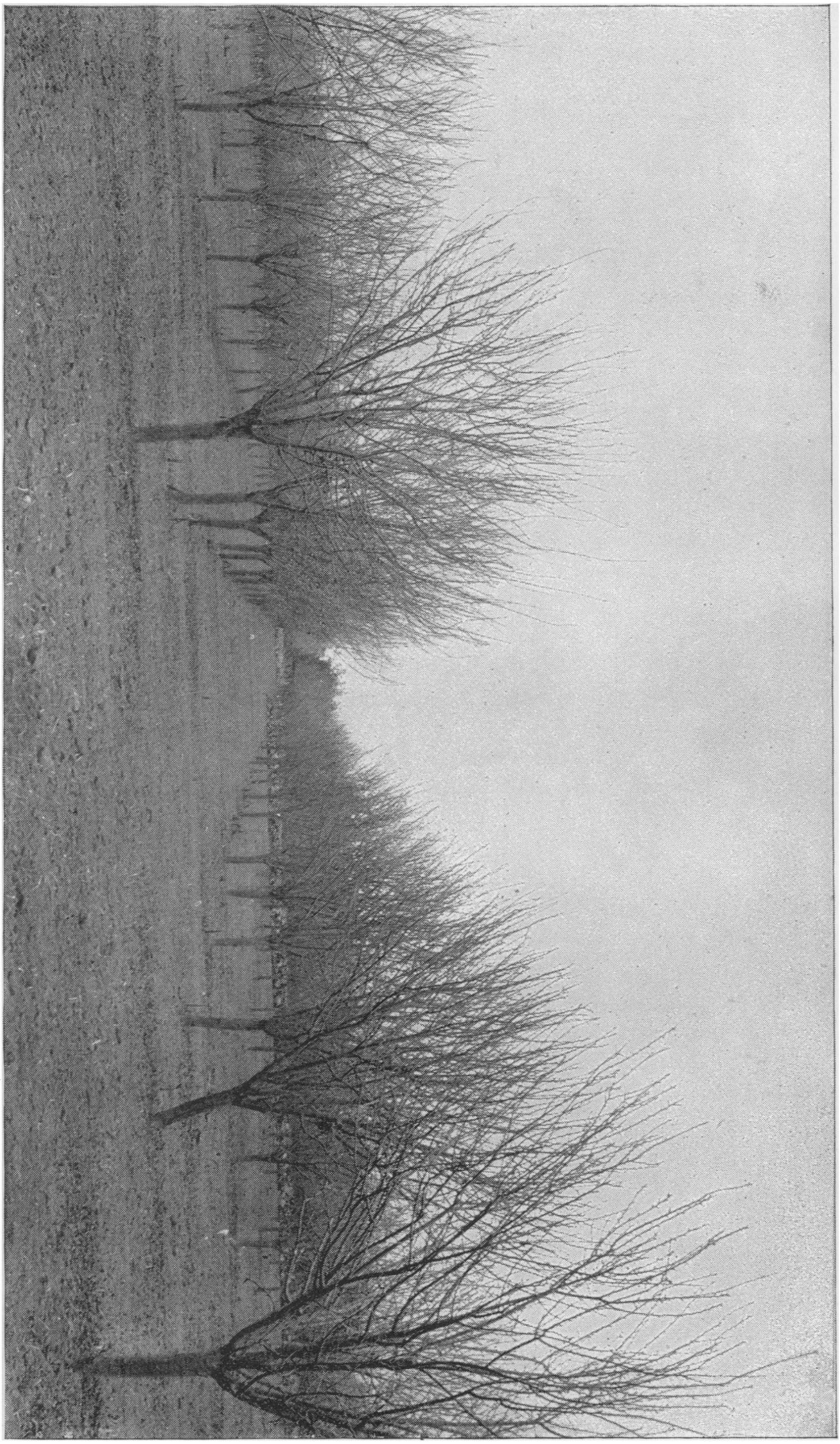
About 350 prune trees 5 years old were sprayed in the Leslie orchard with 600 gallons of modified eau céleste, the application of which required three men and a team for thirteen hours. In this work the San José nozzle was used. The corrosive action of the spray injured the plates of the nozzles so that more of the solution was used than was required to do the work. The direct throw of the spray added to this loss and the loss of time was proportionate. From carefully kept records of my own experimental work, it appears that at least 25 per cent more material and time was consumed in this orchard than was needed if the work had been done with ammoniacal copper carbonate applied with a lateral nozzle. This would reduce the spray needed to 450 gallons, and the time for applying to about ten hours. The cost of 450 gallons of ammoniacal copper carbonate at $1 per 100 gallons is $4.50. Estimating the cost of a man and team at $3 per day, and of 2 men for applying the spray at $1.50 each per day, the cost of applying the spray would be $6 for ten hours, or 60 cents per hour. At this rate the total cost is $10.50 for 350 trees, or an average of 3 cents per tree for a single spraying. This is not an underestimate, where the chemicals are purchased at wholesale prices and properly applied. The expense of spraying large trees will be increased in proportion to the increase in size.

The number of treatments necessary to prevent the injurious effects of the parasite varies from season to season. In the East the treatments should be more numerous and at shorter intervals than in California. At present it is believed that in southern California two thorough sprayings of the prune tree will sufficiently keep the parasite under control. Although no rigid rule can be given as to dates, it is probable from the past season's work that the first treatment may be safely made about the time the trees cease to bloom, and when the old wood is in nearly full leaf. A second spraying should be made after a fair amount of new wood and foliage has been formed. When these two treatments are carefully and thoroughly made, say about the 1st of May and again about the 1st of June, varying according to conditions, it will rarely be found necessary to treat the trees a third time, unless the orchard be situated in a low and damp region. In this case a third spraying may be given two to three weeks after the second.

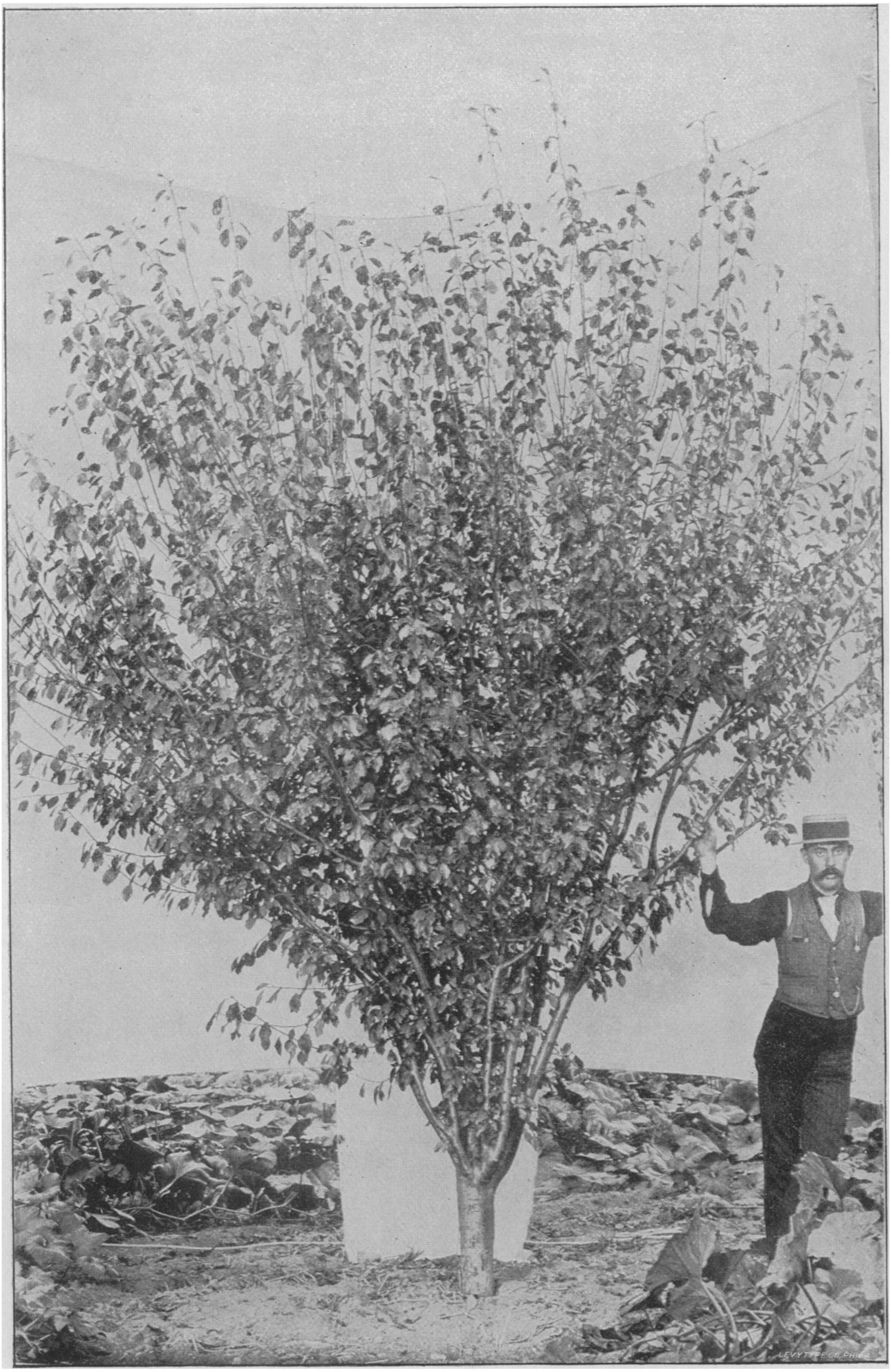
The dry summers of California allow the spray to remain on the foliage until the fall rains, that is, in cases where the applications are made after the last spring rains. In the Santa Ana Valley trees sprayed in May clearly showed the copper on their leaves as late as the last of October.



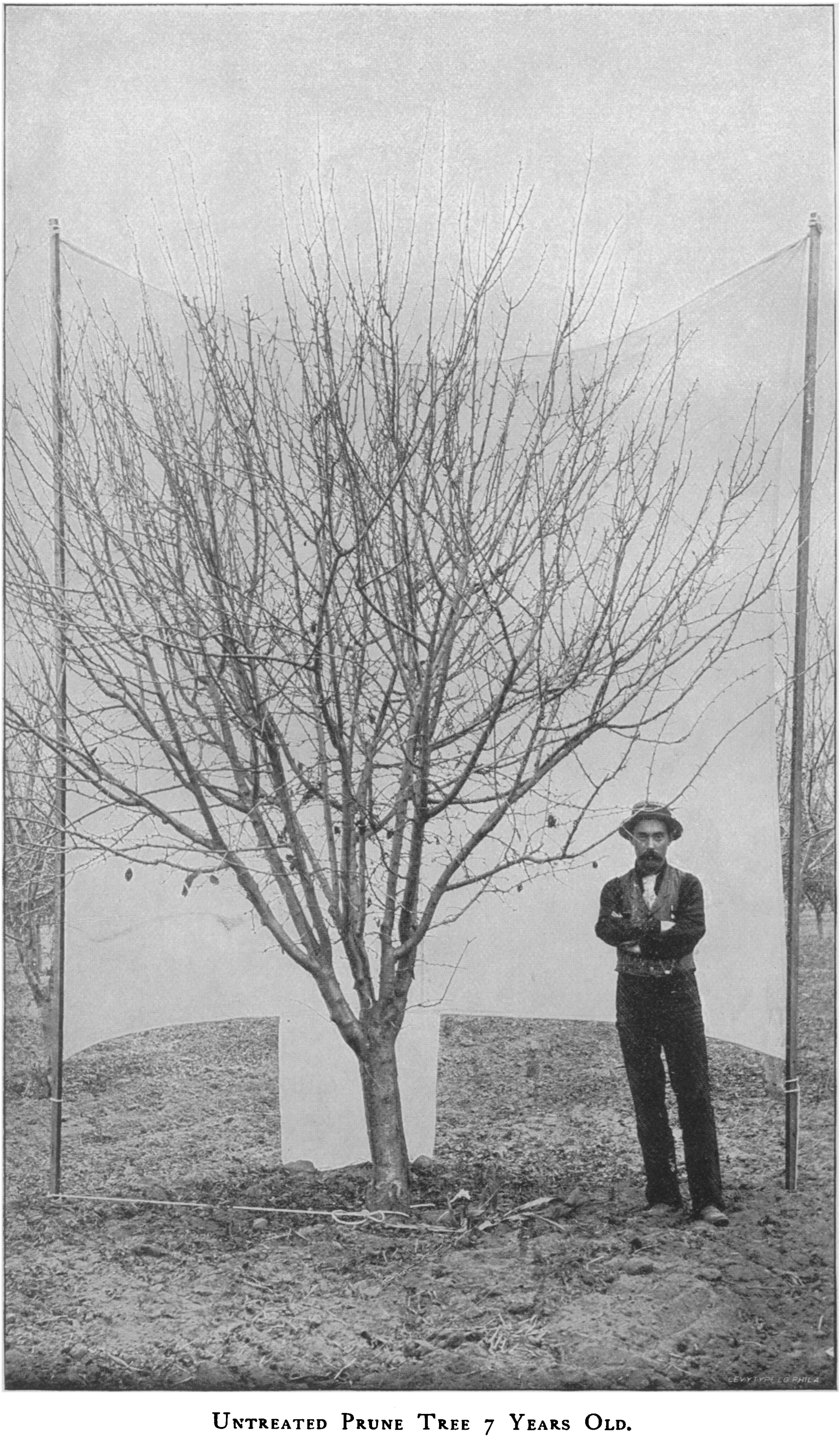
Prune Orchard Treated for Rust.



PRUNE ORCHARD UNTREATED AND DEFOLIATED BY RUST FUNGUS.



TREATED PRUNE TREE 5 YEARS OLD.



Untreated Prune Tree 7 Years Old.

DESCRIPTION OF PLATES.

PLATE XXXIV.—Leslie prune orchard, 7 years old, grown on a rich, deep, fine sedimentary soil; situated about 2 miles northwest of Santa Ana, Cal.; affected by rust in 1891 and again in 1892. It was sprayed with modified eau céleste during the first half of June, 1892, receiving one treatment during the season. This treatment was sufficient to cause the trees to retain their foliage, to the extent shown, unt.l October 4, when the photograph was taken. Compare with Plate XXXV, which shows the untreated half of the same orchard.

PLATE XXXV.—Unsprayed half of the prune orchard represented in Plate XXXIV. The trees were defoliated through the action of rust. Photographed October 3.

PLATE XXXVI.—Prune tree 5 years old, treated about the 1st of June, 1892, with modified eau céleste. This tree was in an orchard affected by the rust, and should be compared with the tree shown in Plate XXXVII. Photographed October 3, 1892.

PLATE XXXVII.—Prune tree 7 years old and wholly defoliated by rust. Had been bare some time before the photograph was taken on October 3, 1892. Compare with Plates XXXIV and XXXVI.

PRELIMINARY NOTICE OF A FUNGOUS PARASITE ON ALEYRODES CITRI R. & H.

By H. J. WEBBER.

In the course of some investigations on "sooty mold,"* a fungous disease of the orange and other citrous fruits, it was soon learned that in order to successfully combat the fungus means must first be found to remove the insect pests, which evidently induce the disease. In Florida the "sooty mold" is principally nourished by the honeydew excreted by *Aleyrodes citri* (the so-called "white fly") and certain waxy scale insects and aphids; however, it becomes serious only as it follows *Aleyrodes citri.* In view of these facts, experiments have been conducted for the purpose of determining the most effective means of combating *Aleyrodes.* Attempts have been made to discover insect enemies of *Aleyrodes citri* which would aid in keeping the pest in check, but to my knowledge no such parasite has been discovered. In this state of our knowledge, I am fortunately able to announce the discovery of a fungus which is parasitic on the larvæ and pupæ of *Aleyrodes citri*, and which may prove useful in fighting the insect.

While walking through the orange grove of Mr. J. H. Harp, of Crescent City, Fla., in August, 1893, some leaves infested with the larvæ and pupæ of *Aleyrodes citri* were collected. Mixed with the insects on the same leaves the orange-red pustules of a fungus were found, but nothing was thought of the significance of the discovery at the time. In January, 1894, I visited the orange grove of Mr. W. B. Varn, at Bartow, Fla., and again found the same fungus in considerable abundance. A more careful examination of this material led to the conclusion that the fungus was probably a parasite on the larvæ and pupæ of *Aleyrodes*

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* *Capnodium citri* B. & Desm.